Q.P. Code: 51641

Duration: 3 hours **Total marks: 100**

Please check whether you have got the right question paper

NB: **1.All questions are compulsory**
2. Answers to the same questions must be written together
3. Figures to the right indicate full marks
4. The use of log table/ non programmable calculator is allowed

Q 1 (A) Select the correct option and complete the following statements (12)

i) _____ is a weak electrolyte in an aqueous medium.
a) HCN b) HNO_3 c) $MgCl_2$

ii) pH of 0.004 M NaOH is _____ in an aqueous medium.
a) 11.602 b) 1.160 c) 0.116

iii) Wavenumber is directly proportional to _____ of light.
a) wavelength b) frequency c) speed

iv) _____are also called as super cooled liquids.
a) Crystalline solids b) Amorphous solids c) Metallic solids

v) The bond angle X–P – X in PX_3 get reduced _____.
a) with increase in electronegativity of halogen atom
b) with decrease in electronegativity of halogen atom
c) no effect of electronegativity of halogen atom

vi) A covalent bond is called coordinate bond when_____.
a) both the bonded atom contribute one electron each
b) one of the two bonded atom contribute both the electrons
c) there is no sharing of electron pair between the combining atom

vii) The standard reduction potential of a Standard hydrogen electrode is_____.
a) 0.0 V b) 1.0 V c) 2.0V

viii) The strongest reducing agent in the electrochemical series is_____.
a) hydrogen b) iodine c) lithium

ix) Heat of hydrogenation of cyclohexene is_____.
a) – 28.6 Kcal/mol b) – 56 K cal/mol) – 49.8 Kcal/mol

x) Anti-aromatic compound is _____stable as compared to corresponding open chain compound.
a) more b) less c) equally

xi) In the chair conformation of cyclohexane, all the carbon–hydrogen bonds on adjacent carbon are_____.
a) eclipsed b) staggered c) none of these

xii) _____ conformer is the most unstable conformation of cyclohexane.
a) chair form b) boat form c) half chair form

(B) State whether the following statements are True or False (3)

i) With the increase in the concentration of an electrolyte in the solution ionization decreases.

ii) Copper metal is extracted from molten matte through Bessemerisation.

iii) Aromatic compounds undergo substitution reactions.

(C) Match the following columns (5)

Column -A		Column-B	
i.	Strong electrolyte	a	Potassium permanganate
ii.	Crystalline solid	b	Meta directing
iii	Acts as self indicator in volumetric analysis	c	Perchloric acid
iv	Geometry of BrF_5	d	anisotropic
v.	– CN	e	Isotropic
		f	Square pyramidal
		g	Trigonal bipyramidal

Q. 2 (A) (i) What will be the pH of a solution obtained by mixing 800cm^3 of 0.05 M NaOH and 200 cm^3 of 0.1M HCl assuming complete dissociation of the acid and the base? **(5)**

(ii) Describe any two applications of common ion effect in the qualitative analysis of cations. **(3)**

OR

Q.P. Code: 51641

(A) (i) Define a buffer solution? Explain the mechanism of the buffer action for an acidic buffer. **(5)**

(ii) Calculate the pH of a solution when 0.3g of NaOH is dissolved in water to give 200 cm^3 of a solution (Molar mass of NaOH =40). **(3)**

(B) (i) Calculate the energy and frequency (in wave number) of red light having a wavelength of 680 nm. ($c=3 \times 10^8$ m/s: h =6.626 $\times 10^{-34}$Js). **(5)**

(ii) Explain the plane of symmetry in a cubic crystal. **(3)**

OR

(B) (i) a) State law of Rational Indices. **(2)**

b) Determine the Miller indices of the following Weiss Indices **(3)**
1: ∞ : ⅔ .

(ii) Define quanta of energy. Give the electromagnetic spectrum in order of decreasing wavelength. **(3)**

(C) (i) Define a) Buffer capacity b) Diprotic acid **(2)**

(ii) Define a) Crystallography b) Space lattice **(2)**

OR

(C) (i) Define a) Triprotic acid b) Degree of ionization. **(2)**

(ii) State the law of Symmetry. **(2)**
How many elements of symmetry are there in a cubic crystal?

Q. 3 **(A)** (i) Explain the Sidwick-Powell theory .On the basis of this theory; predict the shape of BF_3 molecule. **(5)**

(ii) Write a comprehensive note on 'Fajans rule'. **(3)**

OR

(A) (i) Draw the Lewis dot structure of the following. **(5)**
a) NO_2^- b) CO_2

(ii) Explain the effect of lone pair of electrons in the geometry of molecule by giving suitable examples. **(3)**

(B) (i) Balance the following equation with stepwise explanation using oxidation number method. **(5)**
$CrO_4^{2-} + SO_3^{2-} \rightarrow Cr(OH)_4^- + SO_4^{2-}$ (Basic medium)

(ii) The standard electrode potential values of iron for the following redox reactions are given below. **(3)**

Redox reactions	**E^0 (V)**
$Fe^{3+}_{(aq)} + e^- \rightarrow Fe^{2+}_{(aq)}$ $Fe^{2+}_{(aq)} + 2e^- \rightarrow Fe_{(S)}$	$E^0_1 = 0.771V$ $E^0_2 = -0.440V$
$Fe^{3+}_{(aq)} + 3e^- \rightarrow Fe_{(S)}$	$E^0_3 = ?$

Construct the Latimer diagram and find out the E^0_3 and ΔG^0 values for the reaction.

OR

(B) (i) a) Explain the titration curve of $KMnO_4$ and Fe^{2+}. **(5)**
b) Calculate the E_{system} for the titration of 50.0 cm^3 of 0.1 M Fe^{2+} solution against 0.02M $KMnO_4$ at the equivalence point when the pH=1 at 298K
Given: [$E^0_{Pt/Fe^{3+}, Fe^{2+}} = 0.771V$, $E^0_{Pt/MnO_4^-, Mn^{2+}} = 1.51V$]

(ii) Find out the oxidation number of 'P' in the following. **(3)**
a) H_3PO_4 b) $POCl_3$ c) P_2O_5

(C) (i) Differentiate between electrovalent bond and covalent bond **(4)**

OR

(C) (i) What are the limitations of VSEPR theory? **(4)**

Q. 4 **(A)** (i) Discuss the relative stabilities of cyclopropane and cyclobutane. **(5)**
(ii) Explain transannular strain. **(3)**

OR

(A) (i) Draw the various conformers of cyclohexane and discuss their structures in detail. **(5)**
(ii) Discuss the aromaticity of pyrrole. **(3)**

(B) (i) State and explain Huckel's rule with suitable examples. **(5)**
(ii) Explain the advantages of nitrating mixture. **(3)**

OR

(B) (i) Explain the mechanism of sulphonation of benzene. **(5)**
(ii) Discuss the flipping in cyclohexane. **(3)**

(C) (i) Discuss how Hammond's postulate helps to identify the structure of transition state. **(4)**

OR

(C) (i) With suitable examples give a comparative account of Aromaticity and Anti-aromaticity. **(4)**

Q 5 Attempt any Four of the following

(A) Explain the concept of pH? Show the mathematical relationship between pH and pOH. **(5)**

(B) i) What is meant by quantisation of energy? **(2)**

ii) Mention the three quantised energy levels possessed by molecule. **(3)**

(C) What is Frost diagram? Discuss Frost diagram for Manganese under basic conditions. **(5)**

(D) Explain the application of iodine as redox reagent. **(5)**

(E) What is Friedel Crafts acylation reaction? Give its mechanism. **(5)**

(F) i) Give the following conversions **(3)**

a) Benzene to Acetophenone
b) Benzene to Ethyl benzene
c) Benzene to Cumene

ii) Explain the function of $FeCl_3$ in Chlorination of Benzene. **(2)**

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